UNIVERSITY OF GONDAR

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF MEDICINE, DEPARTMENT OF INTERNAL MEDICINE

Prevalence of HIV Infection and Factors for Transmission among HIV Exposed Infants at Dessie, Woldya and Boru Hospitals, Northeast Ethiopia, June 2015.

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A THESIS SUBMITTED TO DEPARTMENT OF INTERNAL MEDICINE, SCHOOL OF MEDICINE, UNIVERSITY OF GONDAR IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN CLINICAL TROPICAL INFECTIOUS DISEASE AND HIV MEDICINE.

June 2015

Gondar, Ethiopia

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ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Ante Natal Care
ART	Anti-retroviral Therapy
ARV	Anti-retroviral
CPT	Cotrimoxazole Prophylaxis Therapy
CSA	Central Statistic Authority
DNA	Deoxiribose Nucleic Acid
EDHS	Ethiopian Demographic Health Survey
eMTCT	elimination of Mother to Child Transmission
ETB	Ethiopian Birr
HAPCO	HIV AIDS Prevention and Control Office
HIV	Human Immune Deficiency Virus
IRB	Institutional Review Board
MTCT	Mother to Child Transmission
NGOs	Non Governmental Organizations
PCR	Polymerase Chain Reaction
PMTCT	Prevention of Mother to Child Transmission
SPSS	Statistical Package for Social Sciences
UOG	University of Gondar
WHO	World Health Organization

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ABSTRACT

INTRODUCTION: Mother-to-child transmission of HIV is still the major mode of transmission of HIV in the childhood period. Worldwide, 1.5 million pregnant women were living with HIV in 2013 with 90% of them in sub-Saharan African countries. The rate of pediatric HIV infections in sub- Saharan Africa remains unacceptably high. Global plan towards the elimination of vertical transmission by the end of 2015 is being implemented.

OBJECTIVE: The aim of this study was to assess the prevalence HIV infection and factors for transmission among HIV exposed infants, Dessie, Woldya and Boru hospitals, Northeast Ethiopia.

METHODS: Institution based cross-sectional study was conducted at Dessie, Woldia and Boru hospitals from March 30 to June 4, 2015. This study considers all HIV exposed infants' and their mothers' from September 2013 to January 2015 by extracting secondary data purposively. Sample size was determined using single population proportion formula. Pre- tested and structured checklist which is adopted from the national standard HIV exposed infant follow up chart and PMTCT registration log book was used to collect the data. A 95% CI and P – value of 0.05 was used to measure the statistical significance and/or to measure the strength of association.

RESULT: A total of 281(93%) infant and mother paired records were included. The prevalence of HIV among exposed infants was 4.6%; 95% CI (2.1, 7.1). Mixed infant feeding (AOR= 7.25, 95% CI: 1.97, 26.69), home delivery (AOR=5.71, 95% CI: 1.48, 22.07) and failure to give ARV prophylaxis (AOR=4.46, 95% CI: 1.02, 19.55) were factors that increased the odds of mother-to-child transmission of HIV in this study.

CONCLUSION AND RECOMMENDATION: the prevalence of MTCT was 4.6% in the study areas. The likelihood of acquiring HIV infection was higher among infants who had mixed feeding, born at home and infants who did not took ARV prophylaxis. Exclusive breast feeding practice, attending institution based labour and delivery and infant ARV prophylaxis was recommended in this study. **Key words:** HIV exposed infants, prevalence, Ethiopia.

1 INTRODUCTION

1.1 STATEMENT OF THE PROBLEM

Mother-to-child transmission (MTCT) of HIV refers to the spread of HIV from an HIV-infected mother to her child during pregnancy, labor, delivery or breastfeeding period. So far MTCT is the most common way that children become infected with HIV(about 90 percent) (1).

Worldwide, an estimated 1.5 million pregnant women were living with HIV in 2013; over 90 percent concentrated in sub-Saharan African countries (SSA)(2). Without any intervention, approximately 15%–45% of HIV-positive mothers will transmit the virus to their newborns (2).

In 2013, of the 3 million children living with HIV/AIDS, 240,000 were newly infected globally (3, 4) with the overwhelming majority again in SSA(4). The rate of pediatric HIV infections in sub- Saharan Africa remains unacceptably high, with over 575 children infected with HIV per day (3, 4). In Ethiopia Mother-to-child transmission of HIV (modeled) after the breast feeding period was 25% in 2013 which is a very high transmission rate (5, 6).

Pediatric HIV has a great contribution to the excessive infant and childhood death rates in sub-Saharan Africa(2). The life expectancy of HIV-positive infants is extremely short. Fifty percent of HIV-positive infants are estimated to die before their second birthday if they do not receive treatment (2). Annually, approximately 260,000 children lose their life due to AIDS-related illnesses (7)

Effective PMTCT intervention involving uptake of antenatal services, use of antiretroviral treatment (ART) by pregnant women living with HIV, safe childbirth practices and appropriate infant feeding, uptake of infant HIV testing and other post-natal healthcare services dramatically reduce the likelihood of infection for the infant (8).

The global plan towards the elimination of vertical transmission of HIV by 2015 was developed in 2011 to reduce MTCT rate to less than 5% and 2% among breastfeeding and non-breastfeeding populations respectively (9). To achieve this goal WHO recommends lifelong ART (option B+) for all HIV positive pregnant and lactating

mothers in resource limited countries while exclusively breastfeeding(10). The infant must also undergo periodic HIV testing and take ARV prophylaxis to prevent transmission of the virus (10). Malawi, the first country to implement option B+ revealed a great reduction of vertical transmission of HIV to 8.5% from previous estimate of 24.7% (11).

The government of Ethiopia also adopted this MTCT Elimination Plan and is currently applying Option B+ to achieve the global target by 2015 (5).

However, in 2013, ART coverage for HIV positive pregnant mothers in Ethiopia was only 55%. This contributes a great effect for this high burden of mother to child transmission rate (5, 12).

Generally this study was conducted to measure the magnitude of MTCT of HIV infection among HIV exposed infants after the implementation of option B+ to achieve the global target by 2015.

It also tries to assess associated factors for the transmission of HIV infection to the HIV exposed infants. This helps to identify the obstacles for the achievement of the global target.

1.2 LITERATURE REVIEW

So far many studies are conducted on prevalence of mother to child transmission of HIV infection among HIV exposed infants and factors associated with increased likelihood of HIV infection.

1.2.1 PREVALENCE OF HIV AMONG HIV EXPOSED INFANTS

The European Collaborative prospective cohort study on HIV infected mothers and their infants in Ukraine reveals an overall MTCT rate of 4.1%. As this article demonstrates 42% of the transmission was from the 8% of women not on ART during the antenatal period of their current pregnancy (13).

Another study done in China, one of the Asian countries indicates a high overall rate of HIV MTCT (13.89% in Guangdong province) (14). The prevalence of mother to child transmission is 3.3% as a study conducted at one tertiary care hospital for armed forces medical services in India reveals (15).

As a study done on effectiveness of PMTCT programme in Tanzania (Kilimanjaro) and urban general population hospital of Angola shows, the prevalence of MTCT among HIV exposed infants is 9.6% and 13.1 respectively. A similar study done in Cameron shows approximately similar MTCT prevalence of 11.6% among HIV exposed infants (16-18). Another study conducted in Kenya, Nairobi to evaluate the effectiveness of option B HAART supports the finding of other researches done in the rest high burden countries of Africa. As it is confirmed by 6 week viral load of infants born to HIV infected mothers the MTCT rate HIV was 10% in the sited area(19).

As a study done in six hospitals of Cross River and Akwa Ibom states of Nigeria indicates the overall prevalence of HIV among HIV-exposed infants less than 18 months is 17.8%. As this study shows regardless of the breast feeding option transmission rates in those mothers and infants who received ARVs for PMTCT is 4.8% compared to 19.5% when both of them miss the intervention (in those infants below 6 weeks of age) (20).

Recently reports of different organizations doing on HIV/AIDS are claiming that the rate mother to child transmission of HIV is decreasing specially in WHO Sub-Saharan

African priority given countries. This fact is supported by different researches conducted in these different African countries. In Malawi the first country to apply option B+, a four month data analysis in 2011 after the implementation of option B+ showed that there is a great reduction of vertical transmission of HIV to 8.5% from estimated prevalence of 24.7% of the same year (11)

One similar study conducted on effectiveness of the prevention of mother-to-child transmission protocol applied in Camille Medical Centre (Ouagadougou, Burkina Faso) showed highly decreasing vertical transmission rate of 0.0% in babies whose mothers were taking ART or were on ARV (AZT/3TC) treatment. But the rate of HIV transmission in orphaned children is still high accounting a vertical transmission of 15.0% (21).

A study done towards the elimination of mother-to-child HIV transmission in South Africa found a 2.7% prevalence of HIV infection among exposed infants as the result on first DNA PCR test indicates (22). This shows that South Africa achieved the global plan for the elimination of MTCT by 2015.

A similar study done on the health outcomes and cost of option B+ as compared to option A in Zambia concludes that there is a 33% reduction in the odds of HIV transmission among HIV exposed infants(23)

Studies done in different sites of Ethiopia also showed that the magnitude of vertical transmission of HIV among HIV exposed infants is still high. This is evidenced by A study conducted to identify the determinant factors and outcome of early diagnosis of HIV infection among HIV-exposed infants in southwest Ethiopia (Woliso Luke hospital) which tries to show an overall prevalence of mother to child transmission of 9.6% (24).

Similar studies conducted on MTCT of HIV and it's predictors in Gondar University hospital and public health institutions in South Gondar zone of Amhara region shows a MTCT prevalence of 10% and 10.1% respectively (25, 26).

1.2.2 FACTORS FOR TRANSMISSION OF HIV INFECTION AMONG HIV EXPOSED INFANTS

1.2.2.1 SOCIO-DEMOGRAPHIC FACTORS

There are many socio-demographic predictors that can influence vertical acquisition of HIV infection among HIV exposed infants. These are sex of the exposed infants, age of the mother, residence, place of delivery marital, educational and occupational status of the mother and number of children a mother has (25, 26).

The likelihood of MTCT of HIV was higher among those from rural areas, enrolled after six weeks of age, delivered at home (25). Infants born to HIV infected rural dwelling mothers are at a 5 times higher odds of MTCT of HIV as compared to HIV infected urban dwelling mothers Infants delivered at home have also 2.82 fold of higher odds of MTCT compared to those delivered at health institution (25).

1.2.2.2 HIV CARE AND CONDITIONS OF MOTHERS

Feeding option of infants, maternal ART or ARV prophylaxis during pregnancy or breastfeeding period, ANC follow up, WHO clinical stage and CD4 count are among maternal factors influencing MTCT of HIV (16, 25-29).

Feeding option of the infant is highly associated with positive HIV test result in the exposed infants as studies done before clearly showed. Infants on mixed feeding practice are at higher likelihood of developing HIV infection (5.7-10.88 times) than infants on exclusive breast feeding counterparts in the first six months of breast feeding period (14, 16, 24, 26).

As many researches done so far indicate using of ARV or ART prophylaxis during pregnancy and/or breastfeeding period helps to highly reduce the vertical transmission of HIV. Mother to child transmission is 4-38.4 times higher if the mother did not receive either ART or ARV prophylaxis during pregnancy or breastfeeding period (16, 25-27).

Place of delivery is also found to be associated with MTCT of the virus. Considering place of delivery those infants born at home are 2.8-6 times more likely to be affected with the disease than infants born at health facility (25, 26).

Clinical stage of the mother during the pregnancy and breast feeding period is also a factor influencing the vertical transmission of HIV/AIDS. Mothers who are in WHO clinical stage III and IV are six and ten times more likely to have HIV sero positive infant compared to those mothers who are WHO clinical stage I respectively (24).

Immune status of the mother in the current pregnancy has a significant association with HIV infection probability of exposed infants. Mothers with CD4 count of greater than 200 is 76% reduction in odds of MTCT of HIV than those below 200 CD4 count (20).

1.2.2.3 HIV CARE AND CONDITION OF EXPOSED INFANTS

Age at diagnosis, ARV prophylaxis for infants, and birth weight of infants were factors influencing the magnitude of mother to child transmission of HIV (25-27, 29).

Since the transmission rate of HIV increases as the diagnosis time is late, age of the infant at the diagnosis of the disease is one of the factors for transmission of HIV infection among exposed infants. Infants tested for DNA/PCR late after the age of 6 weeks are 1.3 to 4 times more likely to have HIV positive results than those tested at six weeks of age or earlier (16, 26, 27).

Giving ARV prophylaxis for the exposed infants is a protective measure of mother to child transmission of HIV. Infants who do not receive any prophylaxis are 6.7-130 times more likely to be infected with HIV than those who take the ARV drug (16, 26, 29). Infants with abnormal finding suggestive of HIV infection like chronic diarrhea are 39 fold chance of developing HIV infection than infants with no sign/symptom (29).

Birth weight is another predictor of MTCT in HIV exposed infants. Infants who are under weight (low weight for age) are 2.2 times more likely to be infected with HIV compared to normal weighted exposed infants (17).

1.2.3 CONCEPTUAL FRAME WORK

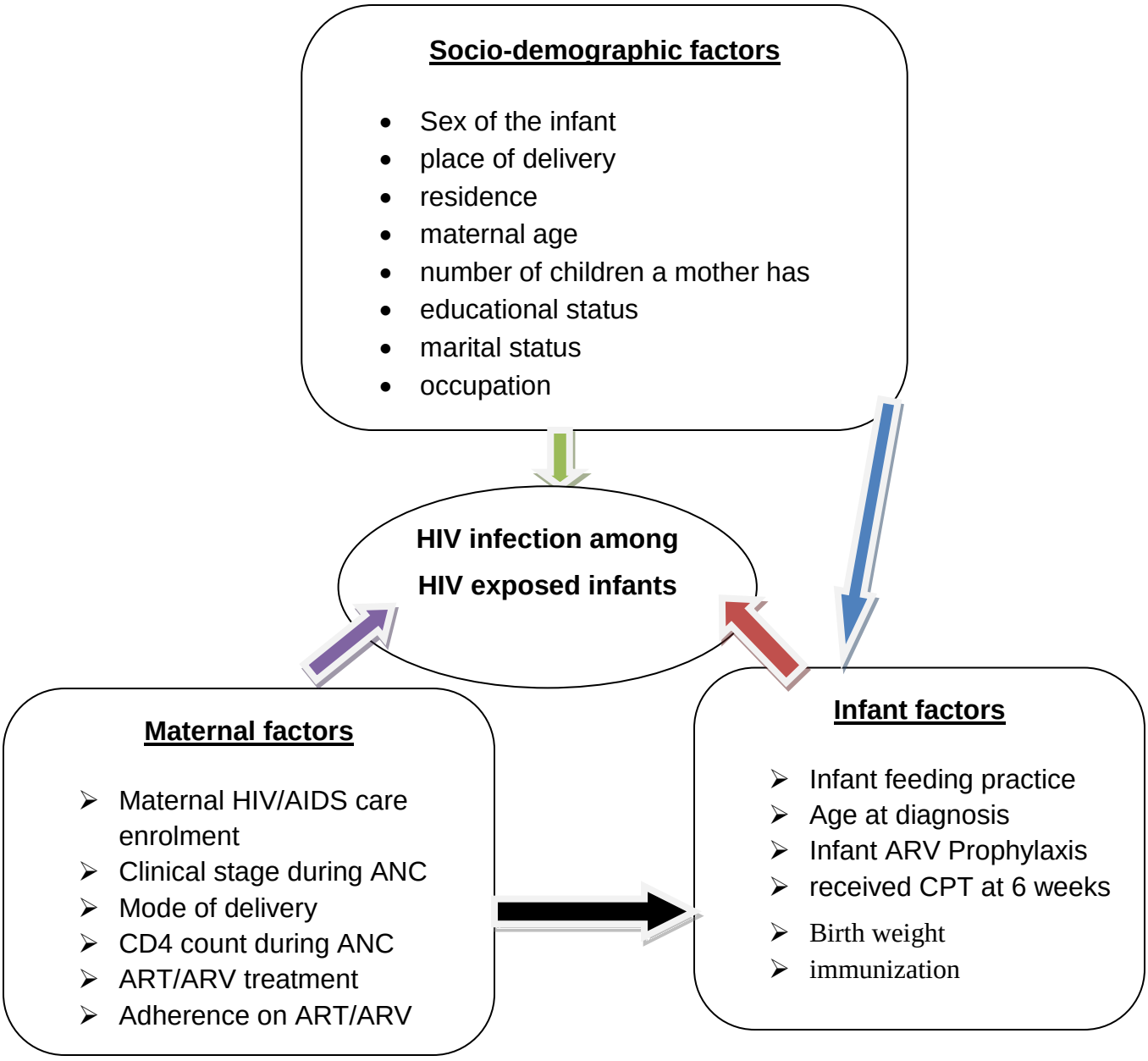

Figure 1: A conceptual frame work on prevalence of HIV and associated factors among HIV exposed infants adopted from review of different literatures at Dessie, Woldia and Boru hospitals, Northeast Ethiopia, 2015.

1.3 SIGNIFICANCE OF THE STUDY

The global society is working towards a common target of minimizing MTCT rate to less than 5% and 2% among breastfeeding and non-breastfeeding populations, respectively (9).

In Ethiopia the prevalence of mother-to-child transmission of HIV after weaning of breast milk was 25% in 2013, which is unacceptably high (5, 6). This was before the implementation of option B+.

Despite this problem limited researches are done to assess the burden of MTCT and factors increasing the odds of infection at national level or in these study areas after the implementation of option B+ as far as my literature review concerns.

So, this study helps to fill the above mentioned gaps.

The result of this research will also serve as an input for the policy makers and medical practitioners to take appropriate measure in reducing vertical transmission.

2 OBJECTIVE

2.1 GENERAL OBJECTIVE

To assess the prevalence of HIV infection and factors for transmission among HIV exposed infants in Dessie, Woldia and Boru hospitals, Northeast Ethiopia, 2015.

2.2 SPECIFIC OBJECTIVES

- To determine the prevalence of HIV infection among HIV exposed infants in Dessie, Woldia and Boru hospitals, Northeast Ethiopia.
- To identify factors for transmission of HIV infection among HIV exposed infants in Dessie, Woldia and Boru hospitals, Northeast Ethiopia.

3 METHODS

3.1 STUDY DESIGN AND PERIOD

A facility based cross-sectional study was conducted from March to June 2015.

3.2 STUDY AREA

The study was conducted in Dessie, Woldia and Boru hospitals which are located in Eastern part of Amhara Region, Northeast Ethiopia.

There were 3256 pregnant mothers living with HIV and 3016 of them get PMTCT service in the year Sep. 2013 to Jan. 2015 in Amhara region. Of these 990 infected pregnant mothers were found in North and south Wollo zones (30).

According to the information obtained from the three hospitals there were 325 HIV positive pregnant mothers under follow up. A total of 303 HIV positive clients were getting PMTCT service from Sep. 2013 to Jan. 2015.

3.3 SOURCE AND STUDY POPULATION

Source population: all infants born from HIV positive pregnant mothers at Dessie, Woldia and Boru hospitals

Study population: Infants born from those HIV positive pregnant mothers who had follow up in Dessie, Woldya and Boru hospitals from Sep. 1, 2013 to Jan. 1, 2015

3.4 INCLUSION CRITERIA

All infants born from HIV positive mothers and having complete necessary information including infant DNA/PCR test results, infant history and maternal history within a period of September 1/2013 to January 1/2015 was included.

3.5 SAMPLE SIZE DETERMINATION

The sample size was calculated by using single population proportion formula by considering the following assumptions;.

Z= 1.96 the corresponding Z-score for the 95% CI

Prevalence = 10% (from previous Ethiopian study at GUH)

Margin of error =5%=0.05

$$n = \frac{(Z_{\alpha/2})^2 p(1-p)}{d^2}$$

$$n = \frac{(1.96)^2 (0.1)(1-0.1)}{(0.05)^2} = 139$$

Table 1: Sample size for major factors for transmission of HIV infection among HIV exposed infants at Dessie, Woldia and Boru hospitals, Northeast Ethiopia, March 2015.

No	Key factors	Assumptions	OR(95% CI)	Sample size
1	Home delivery	At 95% CI, 80% power, Ratio 1:1	6.1 (2.1, 18.6)	120
2	Mixed feeding	At 95% CI, 80% power, Ratio 1:1	8.8 (4.5, 22.8)	296

Generally, a minimum of 296 HIV exposed infants was required to meet the objectives of this study taking the largest of all sample sizes calculated for the prevalence and factors for transmission of HIV infection among HIV exposed infants. Since there were 303 infant-mother pair of charts all of them were considered. 4.3 h=28.3

3.6 SAMPLING PROCEDURES

In the two zones of wollo two general and one referral hospitals are found and all of them were included. All cards of HIV infected mothers and their exposed infant follow up charts from Sep. 2013 to Jan.2015 was revised. Data was collected from those charts having complete information required.

3.6.1 DEPENDANT VARIABLE

- HIV infection status (positive/negative)

3.6.2 INDEPENDENT VARIABLES

Socio-demographic factors

- ✓ maternal education
- ✓ maternal ART or ARV prophylaxis intake
- ✓ place of delivery
- ✓ educational status
- ✓ marital status
- ✓ age of the mother
- ✓ occupation
- ✓ number of children a mother has

Maternal factors

- Maternal HIV/AIDS care enrolment
- Clinical stage during ANC
- Mode of delivery
- CD4 count during ANC
- ART/ARV treatment
- Adherence on ART/ARV

Infant factors

- ✓ Infant feeding practice
- ✓ Age at diagnosis
- ✓ Infant ARV Prophylaxis
- ✓ received CPT at 6 weeks
- ✓ Birth weight
- ✓ Immunization

3.7 OPERATIONAL DEFINITIONS

Mixed feeding practice: giving any type of food or drinks (even water) in addition to breast milk until the age of 6 months at least once except medications.

Abnormal finding: sign and symptoms like chronic diarrhea, persistent LAP, oral thresh, failure to grow, hepatosplenomegally.

Positive HIV infection: when viral DNA is detected from infant blood sample by PCR test

3.8 DATA COLLECTION PROCEDURES

A structured questionnaire was used to collect the data. The tool was adapted from the national standard HIV exposed infant follow up chart, PMTCT registration log book and by reviewing different literatures. The data was collected by four clinical Nurses supervised by one supervisor.

3.9 DATA QUALITY CONTROL

One day training was given to the data collectors and the supervisor on the basic skills of collecting data from the charts, ways of obtaining consent from the managers of the hospitals, and other precautions like how to use the charts confidentially.

Each completed questionnaire was checked for completeness before data entry manually. Then the data was coded & entered in to a computer by using EPI info version 7 software and clean-up was made manually to check accuracy, consistency

and any error identified was corrected. Finally data was exported to SPSS version 20 for further clean up and recoding was also done.

3.10 DATA PROCESSING AND ANALYSIS

After data was entered using EPI Info 7 it was exported to SPSS version 20 for analysis. Bi-variable and multivariable binary logistic regression was used to identify the associated factors. In bi-variable logistic regression p value $\leq$ 0.2 was fitted to multivariable logistic regression analysis.

Crude and adjusted odds ratio with 95% CI was calculated to determine the strength of association between the dependant and independent variables. Variables with p value < 0.05 were considered as statistically significant factors. Hosmer –Lemeshow goodness of fit test was done and the model explained 34.2%.

4 ETHICAL CONSIDERATION

Ethical approval and clearances was obtained from Institutional Review Board (IRB), school of medicine: University of Gondar. Prior to data collection, the objective of the study was discussed with the managers of the three Hospitals to get official permission for data collection.

5 RESULTS

Among the total 303 reviewed mother-infant paired charts, 281(93%) were found to have complete information and then enrolled for the study.

5.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS

Of the total 281 HIV exposed infants, males account 155(55.2%). Majority 241(85.8%) of mothers infected with HIV gives birth in the health institutions and three fourth of the participant mothers 208(74%) were urban dwellers. Of the mothers enrolled in the study 112(39.9%) completed their primary education and 87(31%) cannot read and write. From the mothers participated in the study 88(31.3%) were housewives and 58(20.6%) were unemployed with the mean age of 28.1(± 4.25 SD) (Table 2).

Table 2: Socio-demographic characteristics of HIV exposed infants and their mothers at Dessie, Woldia and Boru Hospitals, northeast Ethiopia (n =281), June 2015.

Variables	Frequency	Percent (%)
Sex of the infant		
Male	155	55.2
Female	126	44.8
Place of delivery		
Home	40	14.2
Health institution	241	85.8
Age of the mother		
15-24	60	21.4
25-34	207	73.7
≥35	14	5.0
Residence		
Rural	73	26.0
Urban	208	74.0

Educational status		
No education	87	31.0
Primary	112	39.9
Secondary	60	21.3
Tertiary	22	7.8
Occupation		
Housewife	88	31.3
Daily laborer	53	18.9
Merchant	26	9.3
Government employee	47	16.7
Unemployed	58	20.6
Others	9	3.2
Marital Status		
Married	200	71.2
Never married	9	3.2
Separated	12	4.3
Widowed	14	5.0
Divorced	46	16.3
Number of children		
1-3	267	95.0
4 and above	14	5.0

5.2 MATERNAL AND EXPOSED INFANT CONDITIONS AND HIV/AIDS CARE

Mothers who gave breast milk exclusively for their infants in the first six months account 223(79.4%). Majority 235(83.6%) of the participant infants receive ARV prophylaxis for the first six weeks. About 254(90.4%) of the mothers were enrolled in HIV/AIDS care and support during ANC period. Great majority 232 (82.6%) of the participants gave spontaneous vaginal delivery. The mean CD4 count of mothers during current pregnancy ANC follow up period was 480.45 (SD ± 177.57) (table 3).

Table 3: Findings on maternal and exposed infants conditions and HIV/AIDS care at Dessie, Woldia and Boru hospitals, Amhara region, Northeast Ethiopia (n =281), June 2015.

Variables	Frequency	Percentage
Infant age at diagnosis		
6weeks	205	73.0
>6weeks	76	27.0
DNA PCR test result		
Negative	268	95.4
Positive	13	4.6
Infant received ARV prophylaxis		
No	46	16.4
Yes	235	83.6
Infant received CPT starting at age of 6 weeks		
No	55	19.6
Yes	226	80.4
Infant abnormal finding		
No	279	99.3
Yes	2	0.7

Table 3 continued

Infant feeding practice	frequency	percent (%)
EBF	223	79.4
Mixed	58	20.6
Infant birth weight		
< 2.5	42	14.9
≥2.5	239	85.1
Infant immunization status		
Immunized for age	245	87.2
Not vaccinated	36	12.8
Mother enrolled in HIV/AIDS care		
No	27	9.6
Yes	254	90.4
Clinical stage during ANC		
Stage 1	270	96.1
Stage 2	11	3.9
Mother received ART/ARV		
ART	281	100.0
Mode of delivery		
SVD	232	82.6
C/S	49	17.4
CD4 count during ANC		
<350	107	38.1
350-500	107	38.1
>500	67	23.8
Adherence		
Good	277	98.6
Poor	4	1.4

5.3 PREVALENCE OF HIV INFECTION AMONG HIV EXPOSED INFANTS

Majority 205(73%) of infants were diagnosed at the age of 6 weeks. The prevalence of HIV infection after DNA PCR test was 13(4.6%); 95% CI (2.1, 7.1)**.**

5.4 FACTORS FOR TRANSMISSION OF HIV INFECTION AMONG HIV EXPOSED INFANTS

In the bivariate logistic regression analysis seven factors including place of delivery, maternal HIV/AIDS care enrolment, infant ARV prophylaxis, age at diagnosis, feeding practice, and immunization status of the infant and maternal CD4 count during antenatal care (ANC) period were associated with HIV transmission having P-values of less than 0.2.

However, in multivariate analysis variables such as place of delivery, infant ARV prophylaxis and infant feeding practice were significantly associated with HIV transmission having a P-value of less than 0.05.

Accordingly Infants delivered at home had 5.71 (AOR=5.71, 95% CI: 1.48, 22.07) times higher likelihood of MTCT compared to those delivered at health institution. If the infant did not receive ARV prophylaxis after birth there is a 4.5 fold (AOR=4.46, 95% CI: 1.02, 19.55) odds of MTCT as compared to those given ARV prophylaxis for the first six weeks after birth. Mixed feeding was also another important factor for vertical transmission of HIV in which the likelihood of MTCT was about seven (AOR= 7.25, 95% CI: 1.97, 26.69) times higher as compared to exclusive breastfed (table 4).

Table 4: Bivariate and multivariate logistic regression analysis of factors for transmission of HIV among HIV exposed infants at Dessie, Woldia and Boru hospitals, Amhara region, northeast Ethiopia June 2015.

	DNA PCR			
Variables	Neg	Pos	**COR(95% CI)**	**AOR (95% CI)**
Place of delivery				
Home	34	6	5.90(1.87-18.56)	**5.71(1.48-22.07)***
Health institution	234	7	1	1
Infant ARV prophylaxis				
no	41	5	3.46(1.08-11.10)	**4.46(1.02-19.55)***
yes	227	8	1	1
Mother had HIV Care during ANC				
no	24	3	3.05(0.79-11.84)	
yes	244	10	1	
Age at diagnosis				
6 weeks	200	5	1	
>6 weeks	68	8	4.71(1.49-14.87)	
Infant feeding practice				
EBF	218	5	1	1
Mixed feeding	50	8	6.98(2.19-22.23)	**7.25(1.97-26.69)****
Immunization status				
Immunized	236	9	1	
Not vaccinated	32	4	3.28(0.95-11.26)	
CD4 count during ANC				
<350	102	5	3.24(0.37-28.31)	
350-500	100	7	4.62(0.56-38.42)	
≥ 500	66	1	1	

*sig. **highly sig.

6 DISCUSSION

Mother to child vertical transmission of HIV is the major mode of transmission of pediatric HIV infection (1). The government of Ethiopia launched a programme to decrease the MTCT of HIV to less than 5% by the end of 2015. To achieve this programme Ethiopia adopted option B+, the latest recommendation by world health organization (WHO) in developing countries (5).

In this study the prevalence of HIV infection among HIV exposed infants was 4.6%. This agrees with a collaborative prospective cohort study on HIV infected mothers and their infants in Ukraine (prevalence of 4.1%) and tertiary hospital in India (3.3%) (13, 15). But it is much lower than the prevalence found in previous researches done in Gondar university hospital and south Gondar health institutions(10 and 10.1% respectively) (25, 26).

The possible explanation could be the implementation of option B+ and increased rate of institutional delivery in this study. In this study 85.8% of the mothers gave birth in health institutions but in previous studies it was lower like 75.6%. This shows the presence of good progress towards the elimination of vertical transmission to less than 5% by the end of 2015 in the areas included this study.

In this study factors that increased the odds of acquiring HIV infection were: home delivery, mixed feeding and failure to give infant ARV prophylaxis.

HIV exposed infants born at home were 5.7 times at higher likelihood of acquiring HIV infection compared to those born at health institutions. This could be explained by the fact that mothers who gave birth at health institution are attended by skilled professionals. This helps to detect and avoid prolonged labor which could decrease vertical transmission. Additionally exposed infants born at health facility will have a chance of getting early ARV prophylaxis which minimizes the likelihood of vertical transmission during labor and delivery.

This result is supported by studies done in south Gondar health institutions and Gondar university hospital, Amhara region (25, 26). As these studies stated; home delivery had a 2.8 and 6 fold risk of acquiring HIV infection compared to institutional delivery respectively.

Consistent with researches done in China; Guangdong province, Cameroon and different parts of Ethiopia (14, 18, 24-26, 29) in this study MTCT was considerably higher for babies who had mixed feeding(13.8%) compared with those who were exclusively breastfed(2.2%).

As the study done in Nigeria recorded the transmission rate of HIV among babies whose mothers practiced mixed feeding was 25.6% for babies aged six weeks to six months compared to 11.8% for exclusive breast feeding babies supporting this study(27). The study done in china recorded mixed feeding infants had a higher HIV MTCT up to 60%. This suggests that exclusive breastfeeding is safer than mixed feeding as a feeding option for HIV exposed infants.

The main explanation for this could be due to gastro-intestinal irritation and infection following mixed feeding which results increased number of activated CD4 cells and mucosal breakage facilitating viral entry to the infant blood circulation.

This study showed giving infant ARV prophylaxis was a protective measure for MTCT of HIV. Infants who did not receive any prophylaxis were 4.5 times more likely to be infected with HIV than those who took the ARV prophylaxis. In this study about 10.9% of infants with no ARV prophylaxis were infected with HIV compared to only 3.4% with ARV prophylaxis. This result agrees with the findings of other researches done in different corners of the world including Ethiopia (16, 26, 27, 29). The study done in one hospital of Angola recorded that the odds of HIV transmission was significantly higher among infants with no postnatal prophylaxis 32.0%, compared to infants with postnatal prophylaxis 7.0% (16). Another study done in Nigeria also revealed a transmission rate of 4.8% in those mothers and infants who received ARVs compared to 19.5% when both of them miss the intervention (27).

Similarly the study done in south Gondar showed a great decrement in transmission from 36% to 4% when ARV prophylaxis was given for infants; supporting the result of this study (26). This result is in line with the widely accepted fact that providing ARVs to the newborn prevents MTCT of HIV. The possible explanation for this could be due to the effect of these drugs to eliminate the virus in the newborn’s blood.

7 LIMITATIONS

- As secondary data was used it was unable to include all the possible confounders (Like socio-economic status of the family, history of PROM, breast lesion)
- Due to incompleteness of data (Maternal HIV-1 viral load was not included)
- This study did not also show the overall prevalence of HIV infection after breast milk cessation.

8 CONCLUSION

The likelihood of mother to child transmission of HIV infection is 4.6% at Dessie, Woldia and Boru hospitals of wollo. The odds of acquiring HIV infection was higher among exposed infants who had mixed feeding, born at home and infants who did not took ARV prophylaxis.

9 RECOMMENDATIONS

To District health offices/Zonal health department/Regional health beuroue/FMOH

- ✓ Strengthen institutional delivery
- ✓ Strengthen exclusive breast feeding
- ✓ Improve/follow ARV prophylaxis provision for infants

To Dessie, Woldia and Boru hospitals

- ✓ To give Continuous counseling on institutional delivery & EBF during their ANC and postnatal follow up

To Parents

- ✓ Mothers should give birth at health institutions and practice exclusive breast feeding
- ✓ Attend health institutions to get ARV prophylaxis for their infants.

To researchers

- ✓ Primary data involving income, viral load and hindrance factors for ARV prophylaxis in HIV exposed infants
- ✓ Determine overall prevalence of HIV infection after breast feeding cessation

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11 ANNEXES

Annex1: Check list for secondary data (Questionnaire)

Prevalence and predictors of HIV infection among HIV exposed infants in Dessie, Woldia and Boru hospitals- a cross sectional study from March to June, 2015.

Check list number……..

Part one: Socio-demographic characteristics

S/no	Questions	Alternatives	Remark
101	. Sex of the infant	0=male 1=female	
102	Place of delivery	0=home 1=health institution	
103	Age of the mother	……(yrs)	
104	Educational status	0=no education 1=primary 2=secondary 3=tertiary	
105	Marital status	0=currently married 1=never married 2=separated 3=widowed 4=divorced	
106	Occupational status	0=housewife 1=daily laborer 2=merchant 3=student 4=gov't employed	

		5=unemployed 6=others	
107	Residence	0=Rural 1=Urban	
108	Number of children a mother has	0=1 - 3 1=4 and above	

Part two: HIV care and support for HIV exposed infants

S/no	Questions	Alternatives	Remark
201	Infant's age at diagnosis	_____(months)	
202	DNA PCR test result	0=negative 1=positive	
203	Infants received ARV prophylaxis	0=Yes 1=No	
204	Infants feeding practice	0=Exclusive Breast feeding 1=Replacement feeding 2=Mixed feeding	
205	Infants received CPT at 6 weeks of birth	0=yes 1=no	
206	Birth weight	_____in k.g	
207	Immunization status	0=immunized for his/her age 1=Not vaccinated	

Part three: HIV care and support of HIV mothers

S.No.	Questionnaire	Alternatives	Remark
301	Mothers enrolled in HIV/ART care	0=Yes 1=No	
302	Mother received ART/ARV prophylaxis	0=ART 1=ARV 3=None	
303	Clinical stage during ANC	0=I 1=II 2=III 3=IV	
304	Mode of delivery	0= SVD 1= emergency C/S 2= elective C/S 3=vacuum/forceps assisted	
305	CD4 count during ANC	_____	
306	Adherence on HAART	0=Good 1=Fair 2=Poor	

Annex4**: Declaration**

I, the undersigned, senior MSc student declare that this thesis is my original work in partial fulfillment of the requirements for the degree of MSc in Clinical tropical infectious disease and HIV medicine.

Name: ----------

Signature: _____

Place of submission: School of medicine, College of Medicine and Health Sciences, University of Gondar.

Date of Submission: _____

This thesis work has been submitted for examination with my/ our approval as university advisor(s).

Advisors

Name	Signature
_____	_____
_____	_____

Annex5. Assurance of investigator

The undersigned agrees to accept responsibility for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the research and publications office of the University of Gondar.

Name of the student: ----------

Date:_____ Signature: _____

Approval of the advisor (s)

Advisors:

Name	Signature	Date
1. Mr. Yalemzewod Assefa	_____	_____
2. Dr. Meseret Zelalem	_____	_____